What is claimed is:

1. A varactor comprising:

a diode junction;

a depletion region adjacent to the diode junction; and

a doped region including the depletion region and having a nonuniform dopant concentration profile that increases with increasing depth of the doped region from the diode junction;

and wherein the nonuniform dopant concentration profile causes the varactor to have an approximately linear capacitance/voltage response characteristic.

2. A varactor as defined in claim 1 wherein:

the doped region includes a peak dopant concentration region outside the depletion region; and

the peak dopant concentration region forms a conductive path to and from the varactor.

3. A varactor as defined in claim 1 wherein:

the nonuniform dopant concentration profile is defined by an equation $N=Bxm$, where N is the dopant concentration, x is the depth of the doped region, B is a concentration constant and m is an exponent that determines the degree of curvature of the dopant profile.

4. A varactor as defined in claim 3 wherein m is greater than zero.

5. A varactor as defined in claim 3 wherein m is about 3.

6. A varactor as defined in claim 3 wherein:

B is in a range from about 1.0E13/cm3 to about 1.0E19/cm3; and

m is greater than zero.

7. A varactor as defined in claim 6 wherein B is about 1.0E16/cm3.

8. A varactor for use in an integrated circuit comprising:

a semiconductor substrate;

a first side formed in the semiconductor substrate and being doped with a first type of dopant in a retrograde dopant profile;

Sub B' cont'd

a second side formed in the semiconductor substrate adjacent the first side and being doped with a second type of dopant; and

a depletion region formed within a portion of the first side adjacent the second side upon applying a voltage bias between the first side and second side, the voltage bias also causing a capacitance between the first side and the second side that is linearly variable with the voltage bias.

9. A varactor as defined in claim 8 wherein:

the retrograde profile of the first type of dopant in the first side includes an increasing dopant concentration with increasing depth from the second side to a peak concentration region; and

the peak concentration region functions as a conductive path to and from the varactor.

10. A varactor as defined in claim 8 wherein:

the first side is a generally horizontal bottom side; and

the second side is a top side generally parallel to the bottom side.

11. A method of forming a varactor in a semiconductor substrate comprising:

forming a first doped region of a first dopant type with a nonuniform dopant concentration profile from a low-doped end of the first doped region to a high-doped end of the first doped region;

forming a second doped region of a second dopant type adjacent the low-doped end of the first doped region;

forming a diode junction between the first and second doped regions;

A

forming a depletion region in the first doped region adjacent the second doped region by reverse biasing the diode junction; and

establishing a capacitance between the first and second doped regions that is approximately linearly related to the reverse biasing.

12. A method as defined in claim 11 further comprising:

forming a conductive path to and from the varactor through the high-doped end of the first doped region.

13. A method as defined in claim 11 further comprising:

forming the first doped region with the nonuniform dopant concentration profile defined by an equation N=Bxm, where N is the dopant concentration, x is the depth of the doped region, B is a concentration constant and m is an exponent that determines a degree of curvature of the nonuniform dopant concentration profile.

14. A method as defined in claim 13 wherein m is greater than zero.

15. A method as defined in claim 13 wherein m is about 3.

16. A method as defined in claim 13 wherein:

B is in a range from about 1.0E13/cm3 to about 1.0E19/cm3; and

m is greater than zero.

17. A method as defined in claim 16 wherein B is about 1.0E16/cm3.